

**Groundfish Food-Resource Division
Sub-Project of the Hecate Strait
Project R/V *G. B. Reed* Cruises in
Hecate Strait, B. C. during June 7-17,
and September 23-October 4, 1985**

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GROUND FISH FOOD-RESOURCE DIVISION SUB-PROJECT OF THE HECATE STRAIT
PROJECT R/V G.B. REED CRUISES IN HECATE STRAIT, B.C.
DURING JUNE 7-17, AND SEPTEMBER 23-OCTOBER 4, 1985

by

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ABSTRACT

Saunders, M. W., R. P. Foucher, A. V. Tyler, and D. F. Moore. 1986.
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During June and September 1985, two stomach-sampling cruises were conducted aboard the R/V G.B. REED in Hecate Strait as part of the Food Resource Division Program's contribution to the Hecate Strait Project. The objectives of the cruises were to collect and preserve, for later laboratory analysis, stomach samples from trawl-caught groundfish species and to sample benthic epifauna and infauna to provide a measure of prey availability.

This report contains bridge log information and trawl-catch species composition by weight, length frequencies by species for full stomachs preserved, empty stomachs, everted stomachs and for the total catch and benthic sample locations.

Supplementary information on water temperatures, vertical plankton hauls, and surficial sediments is also reported.

Key words: groundfish, stomach contents, benthic sampling, benthic invertebrates, size composition, surficial sediments, plankton, Hecate Strait

RESUME

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209 p.

En juin et septembre 1985, deux expéditions d'échantillonnage d'estomacs ont été menées avec le G.B. REED dans le détroit d'Hecate, aux fins de la contribution du Programme de la Division des ressources alimentaires au projet sur le détroit d'Hecate. Les expéditions avaient pour objectif de recueillir et de préserver, aux fins d'analyse ultérieure en laboratoire, des échantillons d'estomacs provenant d'espèces de poissons de fond capturées au chalut et d'échantillonner l'épifaune et l'endofaune benthiques pour fournir une mesure de la disponibilité des proies.

Le rapport contient des données de registre de passerelle, et présente la composition par poids des espèces capturées au chalut, les fréquences de longueur par espèce pour les estomacs pleins conservés, les estomacs vides, les estomacs retournés et pour toutes les prises ainsi que les lieux de prélèvement des échantillons benthiques.

Le rapport fournit aussi des renseignements sur les températures de l'eau, la répartition verticale du plancton et les sédiments superficiels.

Mots-clés: poisson de fond, contenus stomacaux, échantillonnage benthique, invertébrés benthiques, composition des tailles, sédiments superficiels, plancton, détroit d'Hecate

INTRODUCTION

The Hecate Strait Project was initiated to develop an ecological basis for alternative, mixed-species, assessment techniques. The aim of the Food-resource division sub-project of the Hecate Strait Project is to detect patterns of food-resource division among abundant groundfish species in Hecate Strait. The first objective of the two cruises reported here was to collect and preserve, for later laboratory analysis, stomach samples from trawl-caught groundfish species in four areas of Hecate Strait deemed to be representative of three major groundfish assemblages. The assemblages were identified from records of species composition from two 1984 cruises in May-June (Fargo et al. 1984 and Westrheim et al. 1984) in Hecate Strait. These two cruises represent the summer and fall segments of the seasonal comparison study. The September cruise also provided information on the impact of the spiny dogfish, an abundant seasonal predator.

The second objective was to collect and preserve, for later laboratory analysis, grab samples of benthic infauna and epifauna from each of the stomach sampling areas. This work was carried out by staff of the Ocean Ecology section of the Institute of Ocean Sciences (Patricia Bay, B.C.). The benthic samples were collected to provide a measure of prey availability and to monitor change in benthic community structure over time.

This report contains the results of two R/V G.B. REED cruises, June 7-17, and Sept. 23-Oct. 4, 1985. Results from laboratory analysis of stomach contents and benthic grab samples will be reported later.

MATERIALS AND METHODS

FISHING VESSEL

The R/V G.B. REED is a 775-ton, side trawler powered with a 1000-hp diesel engine, and equipped with a controllable-pitch propeller. Overall length is 177' (80 m).

FISHING GEAR

A Yankee 36' trawl net connected to 7' (2.1 m) x 5' (1.5 m), 800-lb (363 kg) V-doors by 20-fathom sweep-lines was used during both cruises. The groundline consisted of 7" (1.77 cm) rubber discs strung on steel cable and was suspended from the fishing line by 12 links of 1" (2.54 cm) chain beackets at intervals of 24" (61 cm).

The mesh sizes in the various sections of the net were as follows:

Section	Internal measure (mm)
Wings	76
Body	76
Intermediate	76
Codend	25

SAMPLING STRATEGY

Three areas (A-C) were sampled during both the June and the September 1985 cruises (Fig. 1; Table 1). Each sampling area was deemed to be representative of a larger area occupied by a distinct assemblage of groundfish species. The assemblages were determined by applying cluster analysis techniques to trawl-catch species composition data from research trawl hauls conducted throughout Hecate Strait in June 1984 (Fargo et al. 1984; Westrheim et al. 1984). During the September 1985 cruise, a fourth area (D) was added to complement Area C, when it was discovered that a shallower predominantly English sole component of the assemblage was missing from catches sampled in Area C.

The dimensions of each of the sampling areas are 3.0 x 3.0 nautical miles (M) with the exception of the most northerly area, Area A, which is 1.5 x 6.0 M. The shape of Area A reflects the narrowness of the band that the assemblage occupies which is, in turn, a function of the steepness of the edge.

Trawl hauls were a standard 30 minutes. The duration of each haul represents time elapsed from the moment the warps were in the towing block to the time that hauling back commenced.

The starting location of each haul within the sampling area was selected at random with the stipulation that the haul could not duplicate any of the hauls made previously during that cruise. The direction of the haul was left to the discretion of the fishing master.

The total catch from a minimum of two hauls in each area was sampled for species composition and stomach contents. When time permitted, further hauls were sampled specifically to increase the sample sizes for infrequently occurring species such as halibut and skates.

Diel sampling took place in area A during the June 1985 cruise and in areas B and C during the September 1985 cruise. Hauls were made every six hours commencing at 0800 hrs. With the exception of these hauls, all fishing was done during daylight hours. Benthic sampling, discussed below, took place between fishing hauls, while stomach sampling was underway.

CATCH PROCESSING

The catch from each trawl haul was sorted by species into plastic tubs capable of holding up to 50 kg. The tubs of fish were weighed, to the nearest kilogram, using a platform scale.

BIOLOGICAL SAMPLING

All fish species in each haul, with the exception of dogfish, skates and ratfish, were measured for fork length. Skates were measured for total length. Dogfish were measured for total length from the tip of the snout to the tip of the upper lobe of the caudal fin when depressed in a line horizontal with the body. During previous cruises (Fargo et al. 1984 and Westrheim et al. 1984) ratfish were measured from the tip of the snout to the tip of the tail, however, a high incidence of frayed and broken tail tips on the larger fish was noted. During the June and September cruises length was measured to the posterior end of the third dorsal fin. Measurements of total length and length to the third-dorsal fin were taken from fish with tails in good condition in order to quantify the relationship between the two length types.

All measurements of length were recorded to the nearest centimeter.

Sex was recorded only for dogfish and halibut.

Stomachs were preserved for detailed laboratory analysis. Stratified samples of 10 stomachs, containing food, per 10-cm length interval for each species were taken. Stomachs were removed from the fish by cutting the esophagus as close as possible to the mouth and by cutting the intestine just posterior to the stomach. The stomachs were sealed in individual plastic bags (Whirlpak) with 10% buffered formalin in sea water. A label giving the cruise, haul, species, and the fish's length was also included. Records of individual fish lengths and the incidence of empty stomachs were kept. In the case of ratfish, the entire gut was preserved because of the short and poorly defined stomach.

BENTHIC SAMPLING

Sampling of benthic infauna and epifauna for later detailed laboratory identification was conducted by staff from the Institute of Ocean Sciences, Patricia Bay, B.C. The benthic infauna was sampled with a Smith-MacIntyre grab. Benthic samples were collected from within each of the stomach sampling areas during both cruises. From a single, central location within each of the stomach sampling areas a total of six replicate grab samples were taken.

From each grab sample, cores of approximately 100-g were removed and stored in plastic bags at 4°C for particle-size analysis. The remainder of each sample was sieved through 1.0, 2.0, and 12.0 mm screens, and preserved in plastic bags with 10% buffered formalin. Rose bengal dye was added to assist in later sorting. From the sixth grab three cores were preserved for possible future identification of smaller infauna and meiofauna not retained by the 1.0-mm screen. Time permitting, a further five individual grab samples were collected at locations widely distributed within each stomach sampling area.

During both cruises a sample of the epifauna was collected from each stomach-sampling area using an epibenthic sled towed for ten minutes. Material retained in the sled was preserved and stored for subsequent identification.

WATER TEMPERATURES

Water temperatures were collected with an expendable bathythermograph (XBT) at routinely occupied stations in Queen Charlotte Sound and Hecate Strait as well as at the end of selected fishing hauls in each stomach sampling area. A minimum of one XBT cast was conducted during each day that a sampling area was occupied.

PLANKTON

Vertical plankton samples were collected at routinely occupied stations in Queen Charlotte Sound and Hecate Strait, with a 350-micron-mesh SCOR net. The net was lowered to within 2 meters of the bottom and raised to the surface at a rate of 1 meter per second. The samples were preserved in 10% formalin in sea water.

SURFICIAL SEDIMENTS

In order to more accurately map the bottom type within each stomach sampling area, surficial sediment samples in addition to those discussed under BENTHIC SAMPLING, were collected within each of the study areas. A Shipek grab, deployed at stations on a one nautical mile by one nautical mile grid, was used to sample the sediments. The samples were frozen for later laboratory analysis of particle-size distribution, to be conducted by staff of the Pacific Geoscience Center (Patricia Bay).

RESULTS

GENERAL

A total of 17 and 19 hauls respectively, were completed during the June 7-17, and September 23-October 4, 1985 cruises. Bridge-log information and species composition by haul are presented in Appendix tables 1 and 2, respectively, for the June and September 1985 cruises. An index to common and scientific names of all fish species caught during both cruises is contained in Appendix table 3.

BIOLOGICAL SAMPLING

Stomachs were collected from 2381 and 2767 fish during the June and September, 1985 cruises, respectively. The numbers of stomachs collected by species and haul are listed for the June and September cruises in Tables 2 and 3 respectively. Length frequencies of fish with stomachs containing food and with empty stomachs for the June cruise are presented, by haul, in Appendix tables 4 and 5, respectively.

The total catch of all species, except arrowtooth flounder, was sampled for length. Arrowtooth flounder from hauls 10, 11, 12, and 14, were subsampled for length using the method of Westrheim (1967). The length frequency of the total catch by species and haul, including arrowtooth flounder subsamples, is presented in Appendix table 6.

Length frequencies, by species and haul, for the September cruise for fish with food in their stomachs, with empty stomachs, and with everted stomachs are presented in Appendix tables 7, 8, and 9 respectively. The length frequency of the total catch by species and haul for the September cruise is presented in Appendix table 10. As above, the arrowtooth flounder length frequency from haul 9 is from a stratified sample.

A page index to length frequencies collected by species for each cruise and length frequency type is presented in Table 4. Measurements of length from the tip of the snout to the tip of the tail and to the end of the third dorsal fin were obtained from 75 ratfish selected with tails in good condition. The relationship of total length and length measured to the third dorsal fin is:

$$\text{Total length} = 1.2033 \times \text{length to the third dorsal fin} + 6.1170; (R^2 = 0.9648).$$

BENTHIC SAMPLING

Benthic-grab samples were collected and invertebrates preserved at stations described in Table 5.

WATER TEMPERATURES

XBT casts were taken at the end locations of thirteen of the sixteen trawl hauls completed during June, 1985 and at seven of the seventeen trawl hauls completed during September, 1985 (Appendix tables 11a and 11b). A total of 14 XBT casts were completed at routinely occupied hydrographic stations in Queen Charlotte Sound and Hecate Strait (Fig. 2; Appendix tables 11a, 11b) during both cruises.

PLANKTON

Vertical plankton hauls were completed at 9 routinely occupied standard stations during both cruises (Fig. 2; Appendix tables 11a, 11b).

SURFICIAL SEDIMENTS

A total of 53 Shipek-grab samples were collected using a Shipek grab during the June 1985 cruise. The station locations and results of the particle size analysis completed by the Pacific Geoscience Center (Patricia Bay, B.C.) are presented in Figure 3 and Appendix table 12.

PERSONNEL

Pacific Biological Station

M. W. Saunders (i/c)	June 7-17 Sept. 23-Oct. 4
R. P. Foucher	June 7-17 Sept. 23-Oct. 4
A. V. Tyler	Sept. 23-Oct. 4
D. Welch	June 7-17
S. Madill	June 7-17
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D. F. Moore	June 7-17
	Sept. 23-Oct. 4
A. Fedoruk	Sept. 23-Oct. 4

E.V.S. Consultants

S. Byers	June 7-17
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Table 1. Food-resource division study areas occupied during the June 7-17, and September 23 - October 4, 1985 R/V G.B. REED cruises in Hecate Strait.

Area	Latitude (N)		Longitude (W)		
	deg	min	deg	min	
A	54	18.5	131	31.0	NW corner
	54	17.0	131	30.0	SW corner
	54	20.5	131	21.0	NE corner
	54	19.0	131	20.0	SE corner
B	53	33.3	131	20.0	NW corner
	53	30.0	131	15.0	SE corner
C	53	12.5	130	50.0	NW corner
	53	9.5	130	45.0	SE corner
D ^a	53	8.0	130	57.0	NW corner
	53	5.0	130	52.0	SE corner

^aSampled during September 1985 cruise only.

Table 2. Numbers of stomachs collected and preserved by species, haul, and area, during the R/V G.B. REED Food-resource division study cruise in Hecate Strait, June 7-17, 1985.

Haul Area Species	1 C	2 C	3 C	4 C	5 B	6 B	7 B	8 B	9 B	10 A	11 A	12 A	13 A	14 A	15 B	16 B	17 C	Total
Arrowtooth flounder	15	26	5	5	-	-	-	-	1	54	73	46	54	56	-	-	47	382
Dover sole	3	3	10	13	-	-	-	-	-	9	21	22	26	8	-	-	3	118
English sole	-	5	3	-	15	15	-	25	-	21	-	-	-	-	20	6	3	113
Flathead sole	-	-	10	11	-	-	-	-	-	-	-	-	-	-	-	-	-	21
Pacific halibut	-	-	-	-	3	10	8	2	2	2	-	-	-	-	-	10	-	37
Petrale sole	-	-	-	-	-	-	-	-	-	1	-	1	-	-	-	-	-	2
Rex sole	13	17	10	-	-	-	-	-	-	32	34	26	16	20	-	-	43	211
Rock sole	-	-	-	-	8	17	19	33	18	-	-	-	-	-	34	39	-	168
Sand sole	-	-	-	-	8	10	20	11	7	-	-	-	-	-	22	23	-	101
Speckled sanddab	-	-	-	-	-	12	6	18	7	-	-	-	-	-	12	12	-	67
Starry flounder	-	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Sebastes alutus	-	20	21	22	-	-	-	-	-	-	-	-	2	2	-	-	21	88
<u>S. babcocki</u>	-	-	-	4	-	-	-	-	-	-	1	-	-	-	-	-	-	5
<u>S. brevispinus</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16	16
<u>S. flavidus</u>	1	-	-	-	-	-	-	-	-	-	1	7	2	1	-	-	3	15
<u>S. paucispinus</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lingcod	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	1
Pacific cod	14	8	8	3	-	-	-	1	-	13	1	5	-	1	-	-	10	64
Sablefish	3	11	16	5	-	-	-	-	-	23	11	1	2	20	-	-	12	104
Walleye pollock	21	31	20	6	1	-	-	-	-	1	5	7	3	8	-	-	42	145
Black skate	-	-	-	5	-	-	-	-	-	-	4	3	16	1	-	-	-	29
Big skate	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Longnose skate	-	1	1	-	1	5	1	2	2	-	-	1	1	-	8	2	-	25
Ratfish	27	26	51	11	-	-	-	-	-	9	26	54	52	10	-	-	32	298
Male spiny dogfish	3	4	4	-	7	1	6	6	6	-	-	3	1	3	2	16	2	64
Female spiny dogfish	32	29	32	17	10	11	9	7	2	9	17	14	3	33	2	27	50	304
Total	132	181	191	102	55	81	69	106	44	174	194	190	178	163	100	136	285	2381

Table 3. Numbers of stomachs collected and preserved by species, haul, and area, during the R/V G.B. REED Food-resource division study cruise in Hecate Strait, September 23 - October 4, 1985.

Haul Area	1 C	2 C	3 B	4 B	5 B	6 B	7 B	8 B	9 A	10 A	11 A	12 A	13 D	14 D	15 C	16 C	17 C	18 C	19 C	Total
Arrowtooth flounder	21	29	-	-	-	-	-	-	42	36	-	28	25	24	44	27	33	41	33	383
Dover sole	8	23	-	-	-	-	-	-	-	-	-	2	5	4	32	27	35	29	25	190
English sole	-	-	-	-	5	-	-	-	11	-	-	-	30	37	-	1	-	1	-	85
Flathead sole	4	2	-	-	-	-	-	-	-	-	-	-	-	-	19	-	22	24	6	77
Pacific halibut	-	-	-	4	-	-	1	-	53	32	-	6	2	3	-	-	-	-	-	101
Petrale sole	-	-	-	-	-	-	-	-	-	-	-	-	18	36	-	-	-	-	-	54
Rex sole	10	-	-	-	-	-	-	-	15	-	1	18	24	22	24	26	22	24	21	207
Rock sole	-	-	1	12	30	26	14	19	-	-	1	-	6	30	-	-	-	-	-	139
Sand sole	-	-	1	10	22	21	20	22	-	-	-	-	-	-	-	-	-	-	-	96
Speckled sanddab	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Pacific sanddab	-	-	-	-	-	-	-	-	-	-	-	-	12	16	-	-	-	-	-	28
Butter sole	-	-	-	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
<u>Sebastes alutus</u>	7	14	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4
<u>S. babcocki</u>	-	1	-	-	-	-	-	-	-	-	-	-	-	-	10	3	3	-	11	48
<u>S. brevispinis</u>	-	-	-	-	-	-	-	-	-	-	5	-	-	-	17	-	3	-	24	45
<u>S. elongatus</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4	5	2	4	11	31
<u>S. flavidus</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	2	-	-	4
<u>S. paucispinis</u>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6	-	15	3	1	25
<u>S. paucispinis</u>	-	-	-	-	-	-	-	-	1	-	-	-	-	-	1	-	-	-	-	2
Eulachon	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9
Lingcod	-	-	-	-	-	-	-	-	4	1	2	-	3	2	-	-	-	-	-	12
Pacific cod	2	1	4	2	24	21	10	-	103	7	11	-	40	10	-	1	-	-	-	236
Sablefish	4	8	-	-	-	-	-	-	-	-	-	2	-	-	19	32	18	13	11	107
Staghorn sculpin	-	-	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2
Walleye pollock	1	-	-	-	-	-	-	-	-	-	-	-	23	21	1	2	-	-	-	48
Black skate	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	2	-	3
Big skate	-	-	3	19	18	28	25	17	-	-	-	-	-	-	-	-	-	-	-	110
Longnose skate	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	3
Ratfish	3	18	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	-	3
Maie spiny dogfish	2	2	31	37	27	15	14	13	-	-	-	-	-	-	13	14	13	21	15	97
Female spiny dogfish	5	2	54	48	70	49	21	35	20	2	-	9	4	8	1	19	2	24	4	210
Total	67	100	94	136	200	160	105	106	262	84	20	67	192	225	193	182	170	224	180	2767

Table 4. Page number index to length-frequencies collected by species, cruise and length frequency type.

Species	June 7-17, 1985 cruise				September 23 - October 4, 1985 cruise			
	Full ^a	Empty	Everted	Total catch	Full	Empty	Everted	Total catch
Flatfish								
Arrowtooth flounder	57	76	-	105	136	157	-	191
Butter sole	-	-	-	-	147	165	-	205
C-O sole	-	-	-	-	-	-	-	203
Curlfin sole	-	81	-	118	-	-	-	203
Dover sole	64	81	-	112	144	162	-	199
English sole	65	82	-	113	145	163	-	200
Flathead sole	60	79	-	108	140	159	-	195
Pacific halibut	61	-	-	109	141	160	-	196
Pacific sanddab	-	-	-	-	135	-	-	189
Petrale sole	67	78	-	117	138	-	-	193
Rex sole	59	78	-	107	139	166	-	194
Rock sole	63	80	-	111	143	161	-	198
Sand sole	66	84	-	115	146	164	-	202
Slender sole	-	-	-	117	-	-	-	205
Speckled sanddab	56	75	-	104	147	165	-	190
Starry flounder	67	-	-	118	-	-	-	-
Rockfish								
<i>Sebastes alutus</i>	53	74	-	99	130	153	167	183
<i>S. babcocki</i>	54	-	-	116	131	165	168	184
<i>S. brevispinis</i>	54	-	-	100	132	154	169	185
<i>S. elongatus</i>	-	-	-	116	148	166	-	205
<i>S. entomelas</i>	-	-	-	116	-	-	-	-
<i>S. flavidus</i>	55	74	-	101	133	155	170	186
<i>S. paucispinis</i>	-	-	-	102	147	165	170	203
<i>S. pinniger</i>	-	-	-	117	-	-	170	204
<i>S. ruberrimus</i>	-	-	-	117	-	-	170	204
Roundfish								
Eelpouts	-	-	-	-	-	-	-	204
Eulachon	-	-	-	116	148	153	-	178
Lingcod	67	-	-	117	-	165	-	203
Pacific cod	50	-	-	96	126	165	-	179
Pacific hake	-	73	-	116	-	165	-	203
Pacific herring	-	-	-	-	-	-	-	204
Pacific sandlance	-	-	-	116	-	-	-	-
Pacific sandfish	-	-	-	-	-	-	-	203
Poachers - unidentified	-	-	-	117	-	-	-	-
Sablefish	56	75	-	103	134	156	-	187
Sculpins	-	-	-	117	147	-	-	188
Shiner perch	-	-	-	-	-	153	-	178
Spiny lumpsucker	-	-	-	-	-	-	-	204
Sturgeon poacher	-	-	-	117	-	-	-	189
Walleye pollock	51	73	-	97	128	-	-	181
Selachii								
Big skate	67	-	-	116	123	-	-	175
Black skate	43	72	-	89	147	-	-	204
Longnose skate	45	-	-	91	148	-	-	204
Ratfish	48	72	-	94	125	-	-	177
Spiny dogfish - female	41	70	-	87	121	151	-	173
Spiny dogfish - male	40	68	-	85	119	149	-	171

^aStomachs sampled that contained food items.

Table 5. Locations of benthic grab sampling stations and epibenthic sled haul positions by Food-resource division study areas occupied during G.B. REED June 7-17, and September 23 - October 4, 1985 cruises.

Station Locations										
	Sta	Latitude		Longitude		Sta	Latitude		Longitude	
		deg	min	deg	min		deg	min	deg	min
Area A	1	54	18.6	131	24.6	6	54	18.8	131	25.5
	2	54	19.3	131	20.0	7	54	18.2	131	27.8
	3	54	20.7	131	20.3	8	54	19.4	131	22.8
	4	54	18.5	131	31.0	Sled from	54	18.0	131	28.1
	5	54	17.5	131	30.5	to	54	17.9	131	25.9
Area B	1	53	32.5	131	17.2	6	53	31.2	131	17.0
	2	53	32.8	131	19.5	7	53	32.0	131	18.0
	3	53	33.0	131	13.8	Sled from	53	32.6	131	16.9
	4	53	30.0	131	13.8	to	53	32.2	131	17.3
	5	53	30.0	131	19.8					
Area C	1	53	11.5	130	48.4	6	53	11.0	130	47.7
	2	53	12.7	130	50.2	7	53	11.4	130	45.6
	3	53	12.6	130	45.3	Sled from	53	11.5	130	48.4
	4	53	9.6	130	45.5	to	53	11.1	130	48.4
	5	53	9.4	130	50.6	Sled from	53	11.8	130	44.7
						to	53	11.4	130	44.7
Area D ^a	1	53	6.3	130	53.0	6	53	6.4	130	54.8
	2	53	8.0	130	57.0	7	53	6.3	130	55.5
	3	53	7.8	130	51.8	Sled from	53	6.5	130	53.0
	4	53	4.8	130	51.8	to	53	6.2	130	52.4
	5	53	4.8	130	56.6					

^aSampled during September 1985 cruise only.

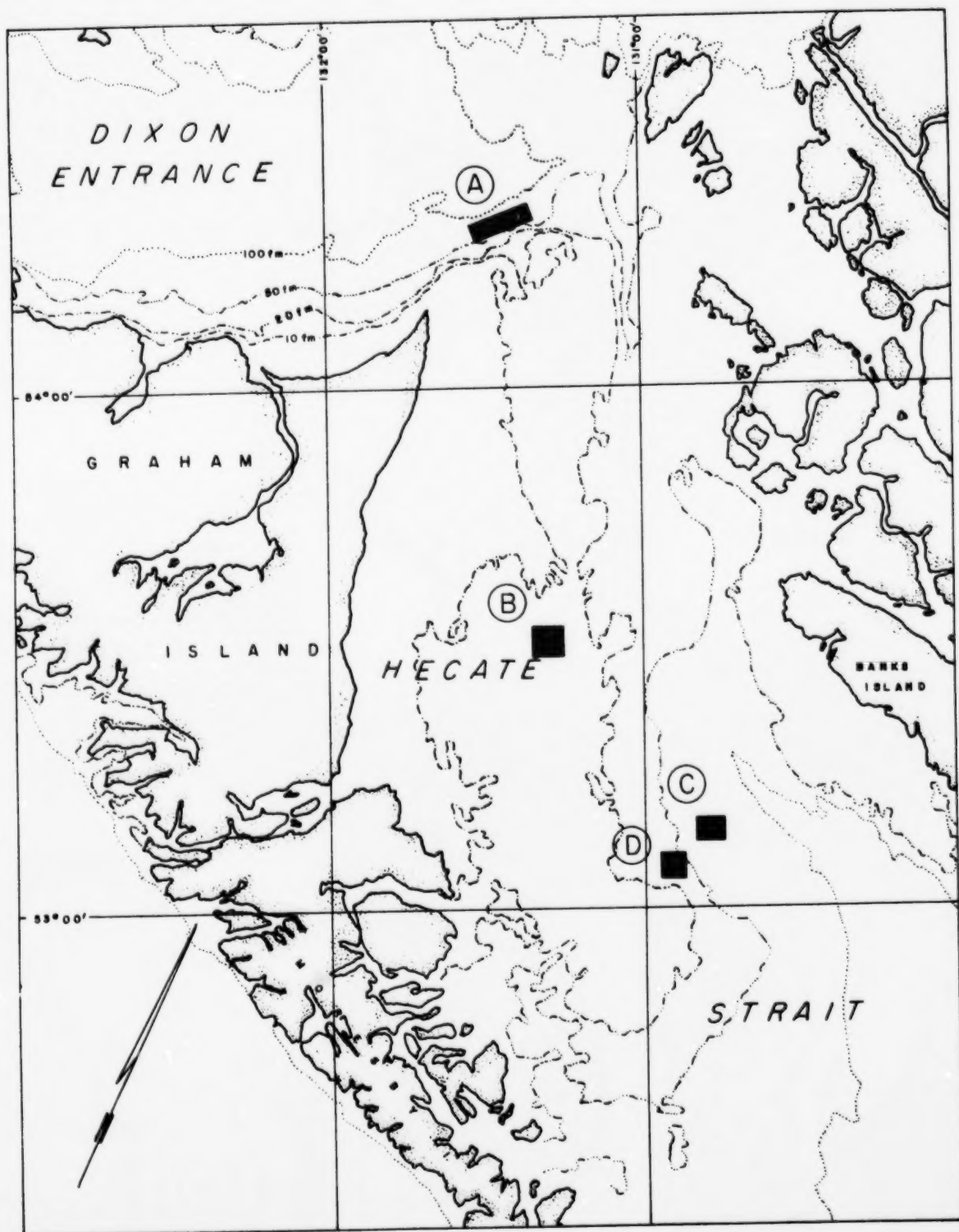
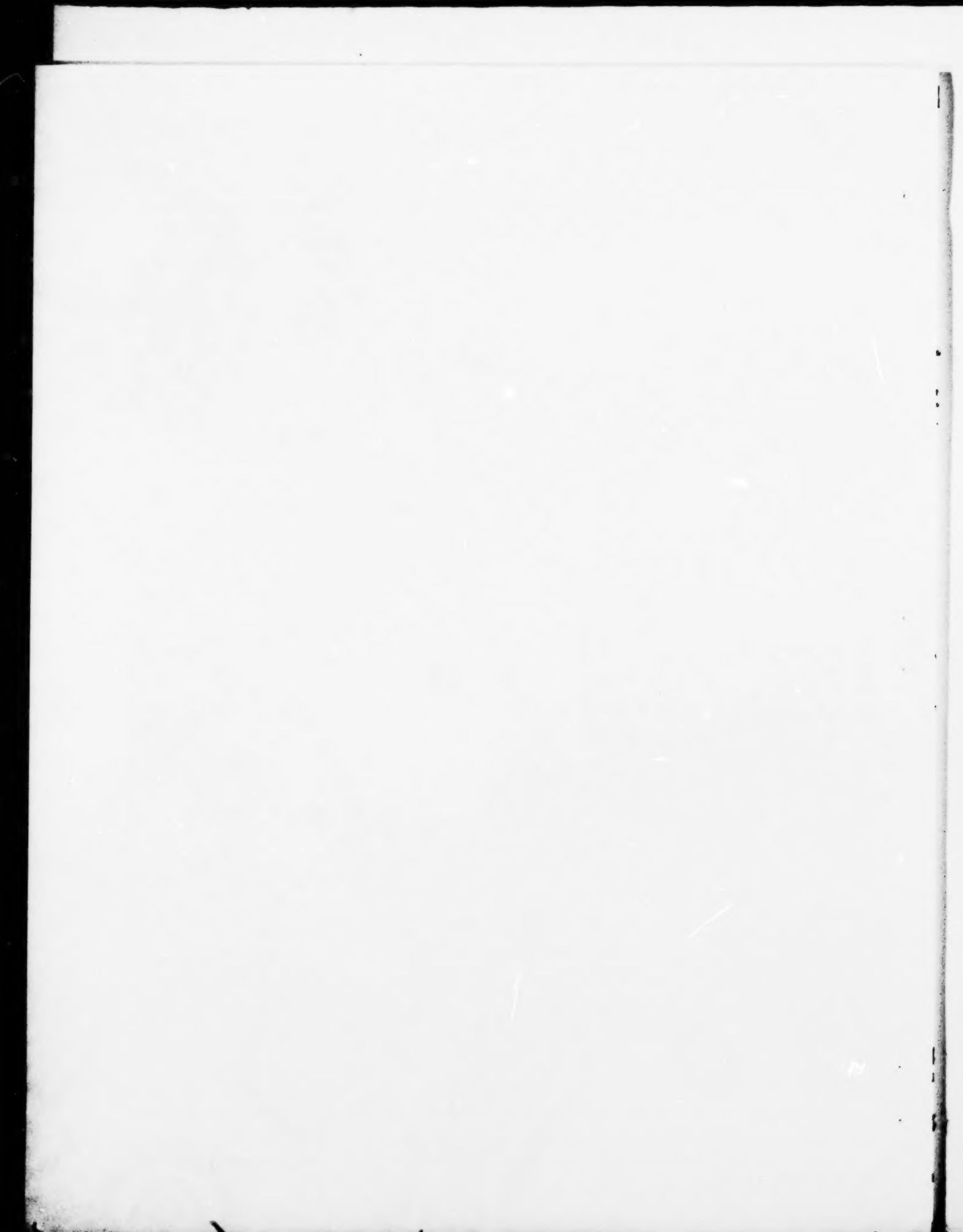


Fig. 1. Chart of Hecate Strait showing study areas sampled during the R/V G.B. REED Food-resource division study cruises June 7-17, and September 23-October 4, 1985.



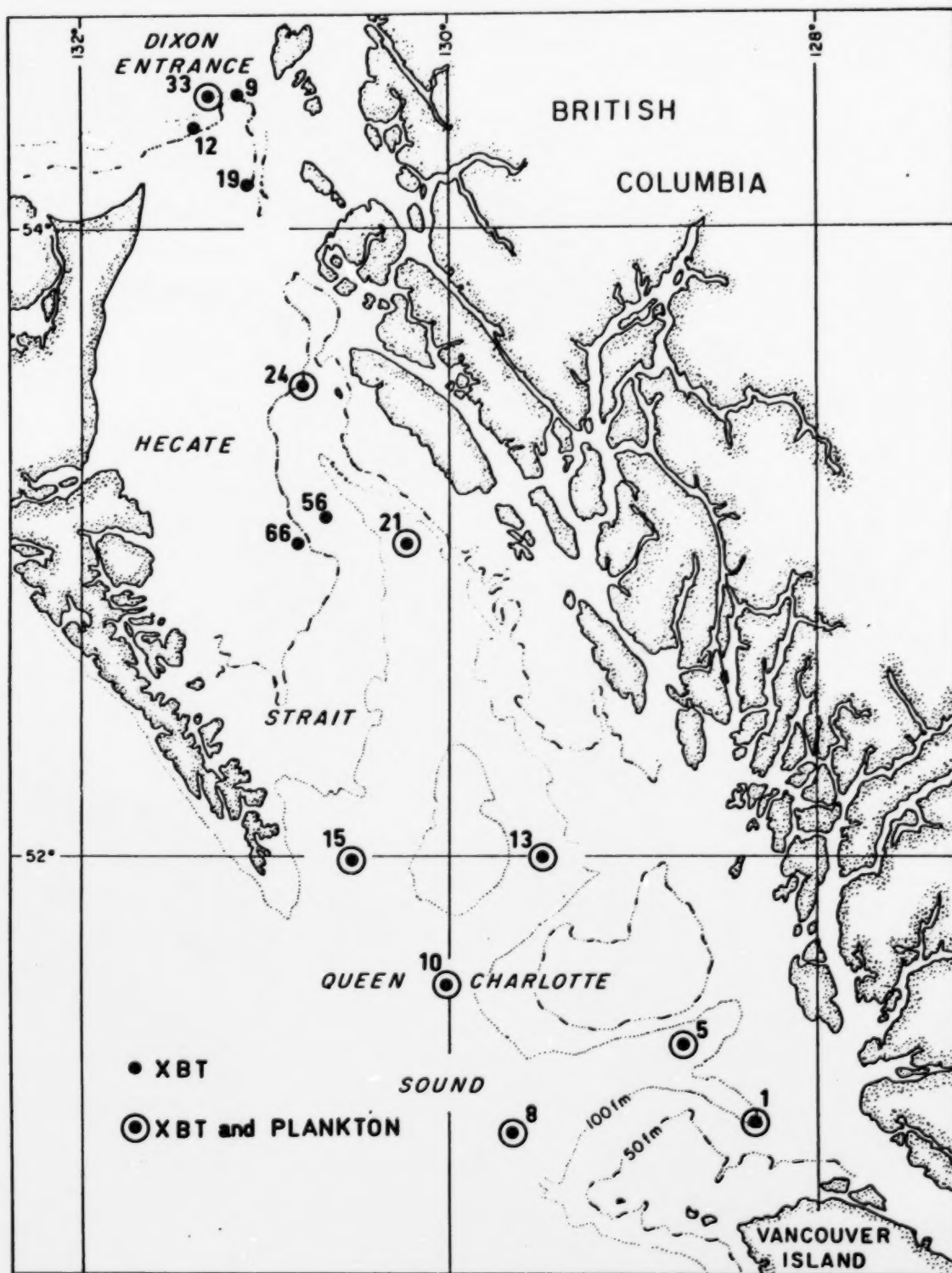


Fig. 2. Chart of Queen Charlotte Sound and Hecate Strait showing locations of XBT and plankton stations occupied during R/V C.B. REED Food-resource division study cruises during June 7-17, and September 23 - October 4, 1965.



Fig. 3. A plot of surficial sediments^a in selected stomach sampling areas in Hecate Strait.

Area A.

mS	mS	mS	mS	mS	sM	sM
mS	mS	mS	mS	mS	mS	sM
mS	mS	mS	mS	mS	mS	mS

Area B.

mgS	mgS	mgS	mgS
mgS	mS	mgS	mgS
mgS	mS	gmS	mgS
mgS	gmS	msG	msG

Area C.

mgS	gmS	mS	mS
mgS	gmS	mS	mS
msG	mS	mS	mS
msG	mS	gmS	mS

^aS = Sand; M = Mud; G = gravel;
s = sandy; m = muddy; g = gravelly.